Reducing Cycle Time By Optimizing Your Product Portfolio

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Abstract- With companies continually striving to reduce cycle time, on the heels of significant gains, many are finding that further substantial improvement is difficult to achieve, especially on new (or breakthrough) products. This paper discusses factors influencing cycle time and means by which obstacles may be overcome to gain further advantages. Included are ways to gain competitive advantage by coupling product development and product portfolio strategy. The result is a new look at the trade off between the product portfolio and time to market. A benchmark study will be presented that demonstrates how product mix can influence cycle time. Once managers understand how their portfolios influence time to market, they have two possible approaches to explore. The first is a set of tools to analyze the portfolio as it relates to risk and development capacity. The second is a set of techniques especially suited for improving the cycle time of new products. Both approaches are recommended for a comprehensive solution to greater competitiveness.

I. Introduction

This paper reviews the results of a study of rapid cycle time companies developing consumer electronics and OEM products. The study explores the practices of 13 organizations as they relate to time to market factors. The companies' products are divided among "portfolio" categories, and time to market is measured for each class of development complexity (see Fig. 1). Portfolio balance is measured by identifying projects (either for new products or processes) as belonging to one of three categories of development: new, derivative, and variant, which are defined as follows:

- *New product:* clean sheet of paper, platform product/process
- *Derivative product:* new generation of an existing platform product/process
- *Variant product:* a modification or line extension of an existing product/process

The data indicate that average time to market is dependent on the portfolio mix *and* the time to market of individual classes of projects. Thus, time to market can be changed by adjusting the relative mix of products (and new processes) in your portfolio. A benchmark study and subsequent research highlights best practices in portfolio management based on proven applications in leading companies. Mapping products into these categories is the first step in gathering information that will enable organizations to make informed decisions about whether to consider adjusting the mix of products to optimize cycle time for specific new products.

Changing the portfolio mix to achieve cycle time reductions may not be the best strategy from a business perspective. If it is not desirable to change the new product mix, what are the alternatives for reducing cycle time? Do these remedies vary as a function of product complexity? The short answer is yes.

II. Product Development Cycle Time as a Function of Complexity

This research is the result of a product development study aimed at understanding how fast the very fastest developers of electronic products are, and how they achieve their level of performance. Concluded in 1996, the study benchmarks 13 organizations (from 12 companies) universally known for short time to market. They consisted of 11 organizations from the U.S. and 2 from Japan representative of electronics manufacturers, including business to business office products, consumer products, and OEM products.

Fig. 1 describes the time to market performance of these developers divided by the categories of complexity. The information is based on the internal definitions of the companies, which was adjusted to ensure comparability. In the cases cited below, time to market starts when management gives it's approval for the project based on some initial estimates of cost, schedule, and performance. The time to market ends at the point of first customer shipment. As can be seen from Fig. 1 below, these "fastest of the fast" performers develop new products in 27 months, derivative products in 12 months, and variant products in approximately 6 months.

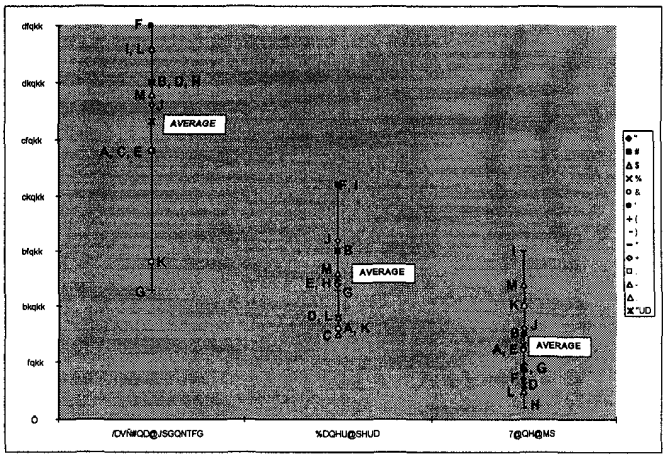

Fig. 1. Time to Market (in months) vs. Complexity

However, these companies have different portfolios of complexity in their product development pipeline. As shown in Fig. 2, there is a large variance in the relative risk tolerance of these organizations as expressed in their product development plans. If an average were suggested, it might be that these developers choose to do about one in five products as new or breakthrough, and two in five as derivatives and variants.

Several observations are in order. For example, doing more products in the new or breakthrough category should result in a shorter time to market in this class of companies, due to experience. On the other hand, those companies that do new products less frequently should experience a

development time longer than average for this class of products. This is the basis for our dilemma.

Weighted time to market (WTTM) can be calculated by computing the weighed average of the products in a category times the relative frequency in that category. Thus WTTM is dependent on the portfolio mix and the time to market of individual classes of projects. This can be described as:

$$WTTM = Sum\ (N_p*TTM_p + N_d*TTM_d + N_v*TTM_v)$$

The dilemma: Time to market can be changed by adjusting the relative mix of products in your portfolio. Should you consider adjusting the mix or should you optimize cycle time for the big, new products?

Below is one example computed for Company "A" in Figures 1 and 2. Two calculations can be performed: first – reducing time to market by changing the mix; and second – reducing (weighted) cycle time by reducing the development time of the longest category, the new/breakthrough products.

The portfolio mix of Company "A" is 40% new, 50% derivative, and 10% variant, with cycle time of 24, 8, and 6 months respectively. Alternatives for reducing time to market are as follows: portfolio mix changed to 10%, 65% and 25% or new/breakthrough time halved to 12 months. These are shown in Fig. 3.

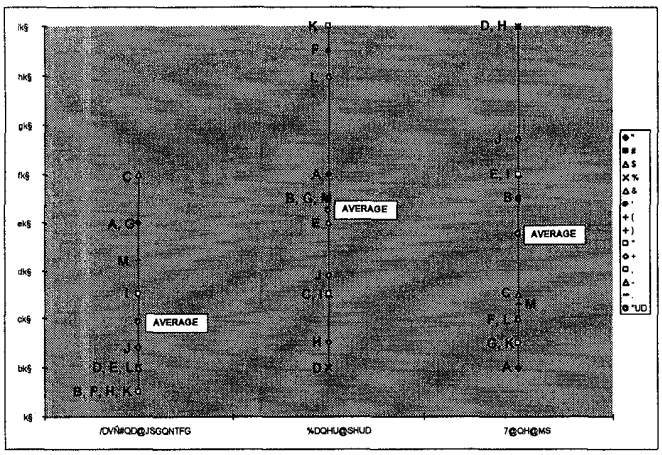

Fig. 2. Relative mix of portfolio (by project, not by effort)

III. What the Data Suggests

This benchmarking study clearly demonstrates several principles. The first is that cycle time is not a monolithic metric, but a variable that depends on the cycle time of underlying projects of vastly different complexity. Second, the average cycle time can be modified in two ways – reducing the cycle time of the longest project (mainly breakthrough projects) or by changing the mix of products in development. It is unlikely the mix of projects in a portfolio will be changed for reasons of cycle time alone. However, this research does indicate that cycle time will be significantly influenced by the relative emphasis on new/breakthrough projects.

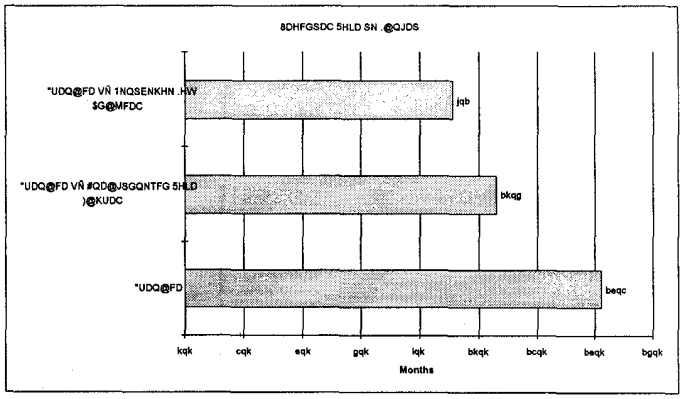

Fig. 3. Weighted Time to Market of company "A" as a function of time to market reduction method. The lowest bar is that of A without any changes, the middle bar shows the improvement possible by shortening the new/breakthrough time to market by a factor of 2. The top bar show the reduction by changing the mix to do fewer new/breakthrough products.

The data also implies that companies that attempt to develop a large number of breakthrough projects should be able to reap the rewards of continuous improvement since they frequently are able to hone their skills. Now let's look at look at two ways of improving product development performance: changing the portfolio and reducing the cycle time of breakthrough products.

IV. Best Practices to Manage Product Development Portfolios

There are many ways to look at and modify the development portfolio to decrease cycle time and improve competitive outcomes. The development portfolio is defined as the relative mix of projects at the current time based typically on risk (or by objectives) and the size of the portfolio relative to the organizational (or financial) capacity. The more common techniques used for portfolio management include: portfolio maps (technology risk versus market risk), portfolio balance (percentage of products and processes that are classified as platform, derivatives, and variants), and portfolio size (the size in relation to the development capacity).

One of the best ways to analyze product development portfolios is to map them against the variables of market and technology risk. Mapping can also be done against any other two dimensions (operational or supplier risks for example). This allows managers to allocate a rational investment to a given amount of risk and supposed return. Although there is no universally right portfolio mix, the mix must be congruent with corporate strategy and risk tolerance. For example, Fig. 4 depicts the mapping between market and technology risks. This example is for a relatively risky portfolio. Often companies choose a "next square" approach which causes projects to be located off the diagonal of the figure.

In addition, many managers choose to do as few new products as necessary to provide quantum leaps in performance. They use this as a "platform" on which to build derivatives and variants. While platform products may or may not pay back the initial investment, the follow-on derivatives, in general, are good investments and can be brought to market rapidly.

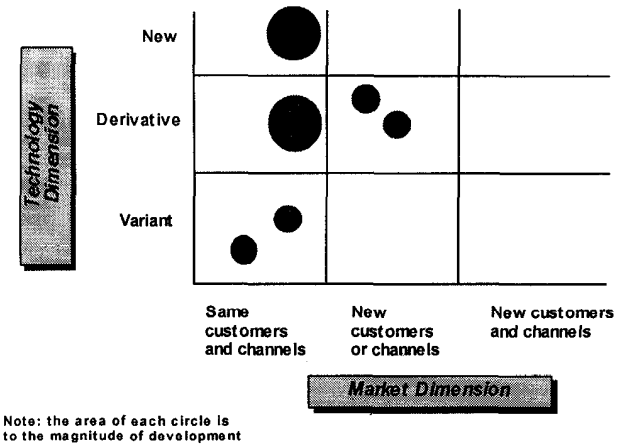

Fig. 4. An example map of a product portfolio showing a relatively risky portfolio (large investments in programs that are high technical risk and medium market risk).

The second tool for process and product portfolio management specifically attempts to understand the variables that describe product and process risk (see Reference 2). This tool, was derived to manage the relative investments in process and product development. One of the most singular contributions of this analysis was to indicate that organizations often are too concerned by product and not enough by process (manufacturing, assembly, and fulfillment). In addition, it is used to help firms maximize the leverage obtained by creating a new product or process platform from which derivatives and variants can be developed.

The third tool for technology management that can be very helpful to improvement of product development speed is correctly sizing the portfolio to the development organization size (see Reference 3). Far too often, organizations have too many projects under development at any given time. On the surface, this does not sound too harmful, in fact it sounds like the status quo. However, when an organization manages this way, it often finds that bottlenecks appear to have disproportionate impact on the development time. By reducing the number of projects under development and simultaneously eliminating the bottlenecks (by process improvements or increased investment), dramatic improvements in cycle time are possible. This treatment borrows from operational research as applied to manufacturing and maps the implications of variance and queue time into the realm of product development.

V. Best Practices to Reduce Cycle Time

Despite the potential rewards, managers may want to leave the mix alone and look at other methods for reducing time to market. Studies have shown that the top two drivers of development schedule slips in new product development are (1) the poor definition of product requirements and (2) unanticipated technical difficulty (see Fig. 5). Fig. 5 illustrates the relative frequency of these two drivers for late projects.

Based on our client research, these two items often have the biggest impact for the new/breakthrough products. These two areas especially plague the new/breakthrough program because the best project managers are assigned, they are given the highest organizational support, the resources they need, and top management attention.

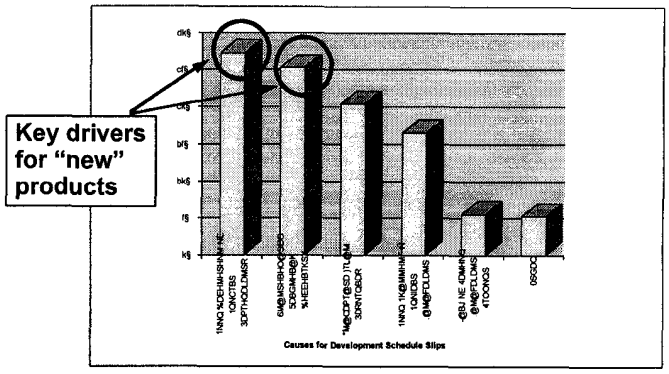

Fig. 5. Analysis of the causes for product development delays (Reference 4).

Market-Driven Product Definition (MDPD) is an effective best practice aimed at reducing the delay (or ensuring that you don't miss the market) in new/breakthrough products. This technique has several merits. It is a systematic process for obtaining customer needs that takes the project team from start (the idea phase) to the end (generation of product specifications) of the early part of a project. It also combines "narrow and deep" aspects of requirements understanding (i.e., customer visitation by the core development team) in the environment of use. The flow of the process is shown in Fig. 6.

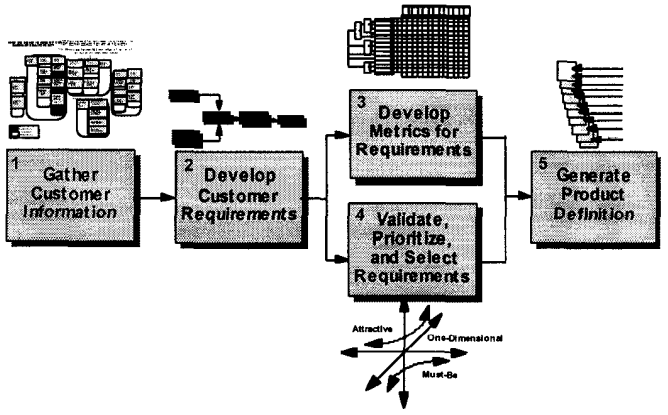

Fig. 6. Market-Driven Product Definition flow diagram for deep understanding of the customer's requirements. (Reference: Product Development Consulting, Inc.)

Market-Driven Product Definition is a tool that can help manage the robust definition of product requirements and clarify the so called *fuzzy front end* of development. MDPD is a comprehensive framework for defining products which integrates many best practices. The process breaks down into roughly five phases:

1. *Gather Customer Information:* This stage involves gaining a common vision of your customer's environment via customer visits by cross-functional teams.
2. *Develop Customer Requirements:* During this stage, the team converts the vision into a set of requirements.
3. *Develop Metrics for Requirements:* This stage is based on the development of a measurement for each

requirement for both competitive analysis and for downstream test requirements.

4. *Validate and Prioritize Requirements:* This stage is designed to foster team understanding of the priorities of the proposed product attributes.
5. *Generate Product Definition:* Finally, the team arrives at a product definition specification.

The visits typically are held with 12-24 customers, spending approximately one day with the customer. The visits are never combined with selling or problem solving. This provides profound understanding of the requirements that the marketing representative could never convey to the team (steps 1 and 2). Furthermore, MDPD also uses "broad and shallow" techniques (the use of survey techniques – steps 3 and 4) to validate the requirements. Thus it is a robust process that ultimately delivers a stable and robust product definition (step 5).

The second best practice, which is oriented towards minimizing technology risks, is a derivative of the Motorola Roadmap process (Reference 5). The Technology Roadmap is a graph linking expected technology implementations to dates and specific products. It is a major component in Motorola's project planning process. This can reduce cycle time because technologies are developed "off line" so that they can be proven in the laboratory before they are handed off to development. Explicit "hand-off" or deployment from technology planning to product developers ensures that the appropriate technology is incorporated into products.

In a prior study conducted in 1995, it was found that this (or a similar best practice is used by about 2/3 of the exemplars studied (Reference 6). They use an explicit process for projecting technology trends in their critical technologies "often" or "exclusively".

VI. SUMMARY

Overall, these studies highlight the importance of characterizing development projects into different classifications for purposes of: 1. portfolio management, 2. improvement methods, and 3. benchmarking comparisons. Without a clear understanding of the fundamental differences between projects of differing complexity, an organization is unable to optimize its process. Furthermore, these studies indicate the value of managing the portfolio not only for market return, but also from the perspective of the development process.

The tools described provide a framework to make trade off analyses that examine the impact the portfolio can have on cycle times for individual projects and for the portfolio as a whole. In addition, it is essential that one optimize the portfolio based on risk tolerance, development capacity, and product life cycle.

Finally, if an organization is going to work on cycle time reduction for platform projects, it may wish to consider Market-Driven Product Definition to secure high quality requirements, and a technology roadmap process to develop technologies "off-line." Reducing cycle time for different classes of complexity will involve different strategies.

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